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IS SUCCESS IN WEIGHT LOSS TREATMENT CONTAGIOUS (DO ATTENDANCE AND OUTCOMES CLUSTER WITHIN TREATMENT GROUPS)?

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Abstract

Data from a trial of a 26-session structured group behavioral weight loss intervention were used to examine how group attendance, weight loss, and changes in depression clustered within therapy groups. Participants were recruited via a population-based survey of female health plan members aged 40 to 65. The sample included 143 women attending 13 therapy groups. Average number of sessions attended was 15.9 (st. dev. 7.2) and average weight loss over 12 months was 4.24 kg (st. dev. 7.79 kg). In hierarchical (random effects) linear models predicting attendance and weight loss, attendance did cluster significantly within therapy groups ($F=2.83$, $df=12$, $p=.002$; $ICC = .14$) but weight loss ($F=0.89$, $df=12$, $p=.56$; $ICC = .00$) and change in depressive symptoms ($F=0.25$, $df=12$, $p=.99$; $ICC = .00$) did not. Accounting for baseline characteristics of group participants had no significant effect on these findings. Relatively small average weight loss in this sample may have limited our ability to detect clustering of weight loss within groups. We conclude that clinicians should consider addressing the effects of drop-out on other group members and that researchers should consider the impact of clustering in analyses of data regarding group treatments.

Keywords

Obesity; Depression; Group Psychotherapy; Attendance

Traditional teaching has emphasized the significant effect of group interactions on individual members of therapy groups [1–3]. This traditional view presumes that a therapy group is not simply the sum of its members, and that outcomes for any individual depend in part on the influence of other group members.

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Surprisingly little empirical research has examined the degree to which attendance or treatment outcomes for one member of a therapy group depend on characteristics of other group members (i.e. the degree to which attendance and treatment outcomes cluster within therapy groups). Some research on group treatments for mental health problems has examined the relationship between group characteristics (such as alliance and cohesion) and clinical outcomes [4–6]. In general, however, previous research has examined associations at the individual level (i.e. Do individuals reporting greater alliance or cohesion experience better outcomes?) rather than at the group level (i.e. Does within-group clustering of alliance or cohesion explain frequency of group attendance or treatment outcomes for individual members within that group?). We are not aware of any research examining group-level effects for weight loss interventions.

Recent statistical literature has given more attention to the degree to which clustering of outcomes within therapy groups should be accounted for in data analysis. It is recommended that clinical trials of group interventions incorporate clustering both in estimating sample size and comparing outcomes [7,8]. Explicit consideration of clustering in data analysis, however, has been the exception rather than the rule [8,9].

Here we report a secondary data analysis from a study of a group behavioral weight loss intervention. We address two specific hypotheses: First, we hypothesize that attendance rates and treatment outcomes (both obesity and depression) cluster within therapy groups more than expected by chance. Second, we hypothesize that clustering of attendance and treatment outcomes within therapy groups is not explained by differences in characteristics of group members prior to starting treatment. Baseline characteristics examined include depression, weight loss self-efficacy, and treatment expectations.

METHODS

Data were drawn from a larger population-based study examining the epidemiology and management of co-occurring obesity and depression. The sample was limited to women because of evidence of a stronger association between obesity and depression among women than among men [10–12]. An epidemiologic survey of women aged 40 to 65 examined the association between obesity and depression. A sample of survey respondents were recruited to a treatment study examining the effect of depression on participation in and success of weight loss treatment. Several previous publications describe findings of the epidemiologic survey regarding the association between obesity and depression as well as potential mediators and moderators of that association [13–17]. Another previous publication describes the primary findings of the treatment study: depression at baseline predicted poorer attendance in the weight loss program but did not significantly predict changes in weight [18]. This secondary analysis uses data from the treatment study to examine clustering of attendance and treatment outcomes within therapy groups.

The study was conducted within the enrolled population of Group Health Cooperative, a prepaid health plan serving approximately 600,000 members in Washington and Idaho. Group Health serves members insured by employers, individual coverage, Medicare, Medicaid, and state-subsidized insurance for low-income residents. Group Health members are demographically similar to the area population.

Health plan records were used to identify women aged 40 to 65, over-sampling those for whom computerized medical records indicated a body mass index (BMI) of 30 kg/m² or more. Potential participants were contacted by telephone and asked to complete a telephone survey regarding weight, depression symptoms, diet, and physical activity. Depression was

assessed using the PHQ-9 [19–21]. Response rate was 59%. Detailed data regarding survey methods and results have been published [22].

Women reporting a BMI of 30 or more were potentially eligible to participate in the treatment phase of the study. All those with PHQ depression scores of 10 or more and a random sample of those with scores below 10 were invited for an in-person assessment to assess eligibility. Of 420 invited, 308 (73%) attended the in-person assessment. Measures administered during the baseline interview included:

- Pre-treatment depression severity was measured by a 20-item scale extracted from the Hopkins Symptom Checklist or SCL [23,24]. This measure has shown excellent convergent validity and sensitivity to change in several large depression treatment trials [25–28]. Possible scores range from 0 to 4 with scores of 0.5 to 1.5 indicating mild depression, scores of 1.5 to 2.5 indicating moderate depression, and scores over 2.5 indicating severe depression. Alpha reliability coefficient in the baseline sample was 0.92.
- Self-efficacy to make dietary changes for weight loss was measured by a 20-item scale developed and validated in previous weight loss trials [29–31]. Scores range from zero (lowest possible self-efficacy) to 180 (highest possible self-efficacy). Alpha reliability coefficient in the baseline sample was 0.91.
- Expected benefit from treatment was measured by a 9-item scale used in previous studies of weight loss interventions [32]. Scores range from a minimum of zero (lowest expected benefit) to 72 (highest expected benefit). Alpha reliability coefficient in the baseline sample was 0.93.

At the in-person assessment, 14 women were found ineligible to participate in the treatment study because measured weight did not confirm a BMI of 30 or greater. Of the 294 women found eligible, 291 (99%) agreed to participate in the treatment phase. Women with low depression scores (n=88) were all offered a group weight loss intervention. Women with elevated depression scores (n=203) were randomly assigned to either the weight loss intervention (n=102, joining the same groups as the non-depressed participants) or to a separate group intervention addressing both weight loss and depression. These analyses include only women assigned to the weight loss intervention)

Of the 190 women assigned to the weight loss intervention, 47 (25%) either withdrew or accepted assignment to a group but never attended. We assume that attendance at the first session would not be related to characteristics of other group members. Consequently, primary analyses in this report concern the 143 who attended at least one session of the weight loss intervention. These participants were assigned to 13 groups with mean of 11 members in each group (range 8 to 14).

The group weight loss intervention was based on previous programs developed and tested by Jeffery and colleagues [32–35]. Group sessions lasted approximately 90 minutes and were scheduled weekly for 12 sessions, bi-weekly for 10 sessions, and monthly for 4 sessions (total of 26 sessions over 12 months).

Each 90-minute session included collection of self-monitoring logs, review of homework assignments, didactic instruction, small-group discussion, and specific skills training and practice. Participants received written summaries of material covered in each treatment session. Content of the sessions centered on behavioral goal setting and self-monitoring of caloric intake, physical activity and body weight. Participants were given daily caloric intake goals of 1200 kcal or 1500 kcal (depending on initial body weight) to produce weight loss of one to two pounds per week. Dietary goals limited fat intake to 20% of daily caloric

intake. Physical activity goals were increased in bi-weekly increments of 500 kcal/wk until the goal of 2500 kcal/wk was reached. Participants were provided with structured meal plans and received specific skills training in environmental stimulus control (e.g., not having high calorie snacks in the home) and problem solving related to weight loss. The program included cognitive and behavioral strategies to address dietary change and barriers to physical activity but it did not explicitly address depression.

Groups were led by one of two masters prepared counselors. The first received initial two-day training from Dr. Jeffery and Ms. Finch; the second had the additional opportunity to observe ongoing groups led by the first. Both therapists received ongoing weekly supervision from the entire study team and were observed by Dr. Ludman throughout the study period for monitoring and maintaining fidelity of the intervention content and structure. Details of the program are available on request.

Once randomized to the intervention condition, each participant was assigned to a specific group according to preference for time and location. Groups were offered at three locations in the Seattle metropolitan area, with daytime and evening groups offered in each location. At each location, recruitment occurred over approximately six months. The two therapists were assigned to groups according to clinic location. Each participant was typically offered a choice of either a daytime or an evening group as well as the option of waiting several weeks until the next pair of scheduled groups began. Each participant was contacted repeatedly until she either attended at least one group session or declined further contact.

All participants were asked to return for in-person research assessments six and twelve months after enrollment. Assessment visits included repeat measurement of weight, repeat administration of the SCL depression scale, and other measures not described here. Each participant was encouraged to attend both assessment visits regardless of participation in treatment groups. Research assessments were distinct from treatment group visits, and research interviewers were blinded to level of treatment participation.

The rate of participation in research assessments was 89% at six months and 85% at 12 months. For participants not attending assessment visits, weight data were available from the medical record for an additional 7% [36]. Follow-up data on depression severity were considered missing for the 15% of participants not attending research assessments. Follow-up data on weight loss were considered missing for the 8% of participants with no weight measurement from a research assessment or the medical record.

Primary analyses examined group attendance and change in weight. Secondary analyses examined change in depression scores. The distribution of baseline participant characteristics, treatment participation and treatment outcomes across therapy groups was examined in two ways. First, descriptive analyses examined the group-level means and standard deviations for each of the 13 groups. Second, hierarchical (random effects) linear models were used to examine the proportion of total variance in each characteristic (e.g. pre-treatment self-efficacy score, weight loss during treatment) explained by group membership. Therapy group was included in each model as a random effect. Intraclass correlation was computed as the variance explained by group membership divided by total variance [37]. An F statistic testing whether intraclass correlation differed significantly from zero was calculated as the ratio of mean square for group membership to the mean square for residual sources of variance [38].

RESULTS

A total of 190 participants were assigned to the intervention condition, and 143 attended at least one group session. Baseline characteristics of those 143 participants are described in

the second column of Table 1. Body mass index was greater than 40 for 28% of participants, between 35 and 40 for an additional 29%, and between 30 and 35 for the remaining 43%. SCL depression scores were in the non-depressed range (<0.5) for 18% of participants, in the mild depression range (between 0.5 and 1.5) for 36% of participants, in the moderate depression range (between 1.5 and 2.5) for 39% of participants, and in the severe depression range (greater than 2.5) for 7% of participants.

Table 1 also presents two indicators of how baseline characteristics clustered within the 13 treatment groups: interquartile ranges and intra-class correlations. The third and fourth columns display group-level mean values for groups at the 25th and 75th percentile for each measure. For age, baseline BMI, and weight loss self-efficacy scores, interquartile means were relatively small in relation to variation in the full sample. For example, mean self-efficacy scores for the 25th and 75th percentile groups differed by 10 points compared to a standard deviation of 34 points in the full sample. In contrast, interquartile means for treatment expectation scores and SCL depression scores were relatively large compared to variation in the full sample. For example, mean SCL depression scores for the 25th and 75th percentile groups differed by 0.55 points compared to a standard deviation of 0.75 points in the full sample. Comparison of between- and within-group variance shows a similar picture. The intra-class correlation (defined as the between-group variance divided by the sum of between- and within-group variance) was approximately zero for age, baseline BMI, and pre-treatment self-efficacy scores. For treatment expectation scores and baseline SCL depression scores, intra-class correlations were significantly different from zero.

Among those attending at least one session, the average number of group sessions attended was 15.9 (st. dev. 7.2). As described above, each participant was encouraged to attend all groups regardless of the number of sessions already missed. Consequently, many participants continued treatment at some level despite missing multiple sessions. To illustrate: 92 participants (63%) continued treatment until the final session, but 51 of those missed five or more sessions during the program. Of the 52 participants discontinuing early, 21 missed 5 or more sessions before the final session attended. As shown in Figure 1, distribution of attendance (defined as total number of sessions attended) appeared to vary considerably between groups, with mean attendance for different groups ranging from 10.9 sessions to 20.6 sessions. As shown in Table 2, the intra-class correlation coefficient for number of sessions attended was moderate in size and significantly different from zero.

Average weight loss over 12 months was 4.24 kg (st. dev. 7.79) with most of this weight loss occurring during the first six months. 37% of participants lost 5kg or more, 35% lost between 0 and 5kg, and 28% lost no weight or gained weight over 12 months. As shown in Figure 2, weight loss over 12 months appeared to vary little across groups, with mean weight loss for different groups ranging from 0.7kg to 6.7kg. As shown in Table 2, estimated between-group variance was approximately zero, leading to an estimated intra-class correlation coefficient of zero.

Average decrease in SCL depression score was 0.37 (st. dev. 0.76), and group-level averages ranged from 0.21 to 0.60. 21% of participants reported a decrease in depression score of 1.0 or greater, 48% reported a decrease less than 1.0, and 31% reported no change or an increase in depression score. As shown in Table 2, estimated between-group variance was approximately zero, leading to an estimated intra-class correlation coefficient of zero.

Because some baseline characteristics of participants did cluster significantly within groups, the clustering of attendance patterns within groups could be explained by pre-treatment differences between group members. The analysis of variance model examining number of sessions attended as a function of group membership was expanded to include the following

possible predictors: age, employment status, educational attainment, baseline BMI, baseline depression score, baseline weight loss self-efficacy score, and baseline treatment expectations. In this model, lower baseline depression score was a significant predictor of greater attendance ($F=4.56$, $df=1$, $p=.035$), and higher weight loss self-efficacy score was a marginally significant predictor of greater attendance ($F=3.51$, $df=1$, $p=.064$). After accounting for all covariates listed above, the intraclass correlation for treatment groups was 0.17 and remained significantly different from zero ($F=3.33$, $df=12,123$, $p<.001$).

Additional analyses examined whether clustering of attendance within therapy groups might be explained by differences between therapists rather than influence of group members. In an analysis of variance model predicting number of sessions attended, therapist (entered as a random effect) was not a significant predictor of attendance ($F=2.5$, $df=2$, $p=.09$). Intraclass correlation was 0.03.

Additional secondary analyses included all 190 participants assigned to a treatment group (including those not attending the first session). The pattern of results was unchanged: attendance clustered significantly within groups ($F=2.16$, $df=12,130$, $p=.017$), but there was no significant within-group clustering for weight loss ($F=0.52$, $df=12,119$, $p=.89$) or change in depression score ($F=0.47$, $df=12,119$, $p=.93$).

DISCUSSION

Among middle-aged obese women participating in a group behavioral weight loss program, attendance clustered significantly within the 13 therapy groups. While two baseline characteristics of group members (depression scores and treatment expectations) also varied significantly across groups, adjusting for baseline differences did not explain the observed clustering of attendance within groups. Thus, clustering effects for attendance did not appear to be a consequence of pre-existing characteristics of group members prior to treatment. Although the various weight loss groups differed significantly in their rates of participant retention, we did not observe any significant clustering of either weight loss or improvement in depression within therapy groups.

Research to identify and understand effects of group interactions on outcomes for individual group members should address a logical sequence of three questions. First, we must determine whether the outcome of interest actually clusters significantly within groups. In this sample, we find that attendance did cluster significantly within groups but weight loss and change in depression did not. Second, we must examine whether any clustering of outcomes can be explained by pre-treatment characteristics of group members, which ensure that the comparison of groups is not biased due to non-random assignment of individuals into groups. In this sample, clustering of attendance within groups was not explained by pre-treatment differences in demographic characteristics, depression, level of obesity, self-efficacy, or treatment expectations. If we observe clustering of outcomes within groups that is not explained by pre-treatment differences, we can then ask whether clustering can be explained by measurable aspects of group interactions or group process. Our study did not include any in-session ratings of group processes. Consequently, our study cannot examine mediators or mechanisms of the clustering of attendance within groups. It is certainly possible that groups differed significantly in cohesion or interpersonal process, but it does not appear that any such differences led to differences between groups in treatment outcomes. Future research might examine whether observer ratings of group cohesiveness or specific in-session behaviors (e.g. criticism, conflict, etc). predict attendance at subsequent sessions.

The observed clustering of attendance within groups could be considered modest or relatively large depending on the application. Only 14% of the variation in attendance was explained by group membership. Nevertheless, this level of clustering could have substantial effect on a comparison of alternative treatments. True confidence limits for comparison of attendance rates would be approximately 60% wider than those estimated by simple analyses.

The treatment portion of this study was designed to examine the influence of depression, self-efficacy and expectations on treatment participation and treatment effectiveness. Consequently, we approached obese women who were not seeking weight loss treatment and did not exclude those with low motivation. We also over-sampled those with elevated depression scores. In addition, a significant number in the non-depressed group reported mild or subthreshold symptoms of depression. As we have previously reported [18], depression was associated with treatment drop-out and poorer attendance. As expected given the study design, we observed significant drop-out and large variation in attendance between individuals. These aspects of the study design may have magnified our ability to examine within-group clustering of attendance.

We must acknowledge, however, that selecting less motivated participants may have limited power to detect clustering of outcomes within groups. Both the mean weight loss of 4.24 kg and mean improvement in SCL depression score of 0.37 points would be considered modest effects. While this sample was relatively large compared to previous reports of group-based interventions, limited variation in the intervention outcomes between individuals may have limited ability to detect clustering of outcomes within groups. Post-hoc power calculations indicate that a sample of 13 groups with 11 members in each would allow 80% power (with two-sided alpha error of 5%) to detect an intra-class correlation of 0.125 or greater. Previous studies of group interventions [8,39–41] have reported intra-class correlations in the range of 0.05 to 0.25 for measures of treatment outcome or group cohesion.

Consistent with an effectiveness trial design, monitoring and control of the treatment program was greater than in typical clinical practice but less than in a traditional efficacy trial. We might expect greater variation in attendance and outcomes in community practice. Conversely, we might expect less variation in a traditional efficacy trial.

More detailed assessment of baseline characteristics might have further explained between-group differences in attendance. Attendance was significantly related to baseline depression, but accounting for baseline depression explained only a small portion of within-group clustering in attendance. Differences in other unmeasured factors, such as personality or interpersonal characteristics, might have explained a larger portion of clustering in attendance. Unmeasured baseline differences between groups might lead to a false positive finding (e.g. concluding that attendance patterns cluster within groups when they actually do not) but it would not be expected to lead to a false negative finding (e.g. finding no significant clustering of outcomes when such clustering does exist).

The nature of the group interventions we studied may have limited our ability to detect group effects on individual outcomes. Both interventions were highly structured with significant didactic content, and this would be expected to decrease variability between groups in treatment quality and treatment outcomes. Most previous research regarding group dynamics and group cohesion has considered group therapy for mental disorders. Group characteristics might also have a stronger effect on individual outcomes in more psychodynamic or process-oriented groups. In addition, group cohesion might have a greater effect on outcomes in the treatment of mental health conditions or other conditions where privacy is a greater concern.

Follow-up weight data were missing for approximately 8% of participants and follow-up depression severity data were missing for approximately 15%. These missing data might have reduced our ability to detect clustering of weight or depression outcomes, especially if participants with missing data were more likely to be influenced by the attendance or outcomes of other group members.

Our findings certainly do not imply that weight gain or weight loss are not influenced by social networks or peer groups. Community-based research has demonstrated significant clustering of long-term weight gain among families and social networks [42].

For researchers, our findings suggest that analyses of data from group interventions should not ignore within-group clustering. While we did not observe significant clustering of outcomes within groups, we did observe significant clustering of both baseline characteristics and group attendance. When analyzing outcomes of group treatments, it is probably not reasonable to assume either that individuals sort randomly into therapy groups or that treatment processes for individuals in groups are truly independent of each other.

For clinicians, our findings only partially confirm conventional wisdom regarding the effects of groups on individual members. In this sample we do not find evidence that treatment outcomes cluster within groups. As discussed above, however, design of this study may have limited our ability to detect such clustering. Significant clustering of attendance within groups suggests that an individual's level of participation in a therapy group is significantly influenced by the attendance of other members. In other words, group drop-out or non-attendance appears somewhat contagious. Given this finding, therapists might choose to more actively address drop-out or non-attendance during the early phases of group treatment.

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Figure 1. Distribution of number of sessions attended across 13 weight loss therapy groups. For each group, plots indicate median (dark line), 25th to 75th percentile (gray box), and 10th to 90th percentile (whiskers).

Figure 2.

Distribution of weight change across 13 weight loss therapy groups. For each group, plots indicate median (dark line), 25th to 75th percentile (gray box), and 10th to 90th percentile (whiskers).

Table 1
Baseline characteristics of study sample and distribution of baseline characteristics across 13 treatment groups.

	Mean (s.d) for Full Sample	Mean (s.d) for group at 25 th %ile	Mean (s.d) for group at 75 th %ile	Between- Group Variance	Within- Group Variance	Intra-Class Correlation	Test for Intra-Class Correlation > 0
Age	52.3 (6.3)	51.1 (4.9)	53.8 (6.5)	0.9	38.8	0.02	F=1.19, df=12,130, p=.297
BMI	38.1 (7.0)	37.1 (5.5)	39.4 (10.9)	0.3	51.7	<0.01	F=0.95, df=12,130, p=.498
Wt. Loss Self-Efficacy	87 (34)	84 (18)	95 (38)	26	1139	0.02	F=1.23, df=12,130, p=.272
Treatment Expectations	53 (13)	46 (11)	57 (11)	12.0	144.5	0.08	F=1.98, df=12,130, p=.031
SCL Depression Score	1.38 (0.75)	1.13 (0.78)	1.68 (0.81)	0.07	0.51	0.12	F=2.29, df=12,130, p=.011

Baseline characteristics of study sample and distribution of baseline characteristics across 13 treatment groups.

Table 2

	Mean (s.d) for Full Sample	Between- Group Variance	Within- Group Variance	Intra-Class Correlation	Test for Intra-Class Correlation > 0
# of Sessions Attended	15.9 (7.2)	7.41	44.5	.14	F=2.83, df=12,130, p=.002
Weight Change (kg)	4.24 (7.79)	-1.1	66.1	0	F=0.85, df=12,119, p=.599
Change in SCL Depression Score	0.37 (0.76)	-0.05	0.63	0	F=0.25, df=12,109, p=.995